Photography: DWR

California's Drought Update

March 30, 2010

State of California
Governor
Arnold Schwarzenegger

The Natural Resources Agency
Secretary for Resources
Lester A. Snow

Department of Water Resources
Director
Mark Cowin

California's Drought Update

Photography: DWR

Drought Operations Center
Phone: (888) 5-DROUGHT
(888) 537-6844)
E-mail: drought@water.ca.gov

Drought website:
http://www.water.ca.gov/drought/

Introduction

This drought bulletin provides a monthly update to California's water conditions. In the spring when seasonal precipitation typically declines statewide after March, there is increased interest in reservoir storage conditions and runoff forecasts to assess available water supplies. The total statewide October through February precipitation was 101 percent of average.

Information in the update is based on hydrologic data compiled through the end of February. This month's report includes: updated information on hydrologic and water supply conditions; comparisons to historical drought conditions; water supply allocations; and local drought impacts by hydrologic region. Additional drought information can be found on the drought website (http://www.water.ca.gov/drought/).

Hydrologic and Water Supply Conditions

Precipitation

The 2009 Water Year (October 1, 2008 through September 30, 2009) was the third consecutive year of below average precipitation for the state. Annual statewide precipitation totaled 76 percent, 72 percent, and 63 percent of average for Water Years 2009, 2008, and 2007, respectively.

Table 1 compares the average monthly contribution to statewide precipitation to the observed precipitation from Water Years 2009 and 2010 (to date). January, April, July, August, September, and November 2009 were exceptionally dry while February, May, June, and October 2010 were well above average. However, Water Year 2009 finished at 76 percent of an average water year. Water Year 2010 through February stands at 101 percent of average. An above average precipitation for the month of January and a below average precipitation for the month of February has brought the WY 2010 average total to normal.

Month of Water Year	Avg CA Precip (inches)	WY 2009 Observed	% of Average	WY2010 Observed	WY 2010 % of Avg
October	1.22	0.73	60%	2.07	169%
November	2.80	2.49	89%	0.77	28%
December	3.91	3.05	78%	3.33	85%
January	4.35	1.26	29%	6.55	188%
February	3.66	5.06	138%	3.40	93%
March	3.12	2.13	68%		
April	1.64	0.59	36%		
May	0.89	1.47	165%		
June	0.35	0.46	133%		
July	0.18	0.02	11%		
August	0.28	0.06	20%		
September	0.48	0.09	19%		
Total	**22.88**	**17.40**	**76%**	**16.12**	**101%**

Table 1. Average statewide precipitation by month with statewide precipitation values from Water Years 2009 and 2010. Data from California Climate Tracker (Western Region Climate Center): http://www.wrcc.dri.edu/monitor/cal-mon/frames_version.html

Although Water Year 2010 average through February indicates normal rainfall levels, March precipitation through March 25, 2010 is slightly below average which may bring down the WY average total (see Meteorology and Hydrology section for updated numbers). Current equatorial sea surface temperature data indicates warm conditions above the El Niño threshold. These conditions are expected to continue at least into the Northern Hemisphere Spring 2010 based on a March 22 update by NOAA's Climate Prediction Center (CPC). The prevailing conditions may enhance the chances of increased precipitation throughout the upcoming spring months, although there have been several El Niño periods in recent decades that have produced drier than average statewide conditions. The CPC's March 18, 90-day seasonal outlook suggests equal chances of above or below normal precipitation throughout California. The same forecast suggests an increased chance of above normal temperatures for all of California except for the Central and Southern Coasts.

The Northern Sierra 8-Station and San Joaquin 5-Station Precipitation Indices track the wetness of the Sacramento and San Joaquin River basins. These indices help correlate the health of the runoff into Central Valley reservoirs. As of March 25, the 8-Station Index is at 96 percent of average to date with the 5-Station Index fairing slightly better at 103 percent of average to date. The annual averages for the 8-Station and 5-Station indices are 50.0 and 40.8 inches, respectively. Figures 1 and 2 show the current indices values compared to other Water Years.

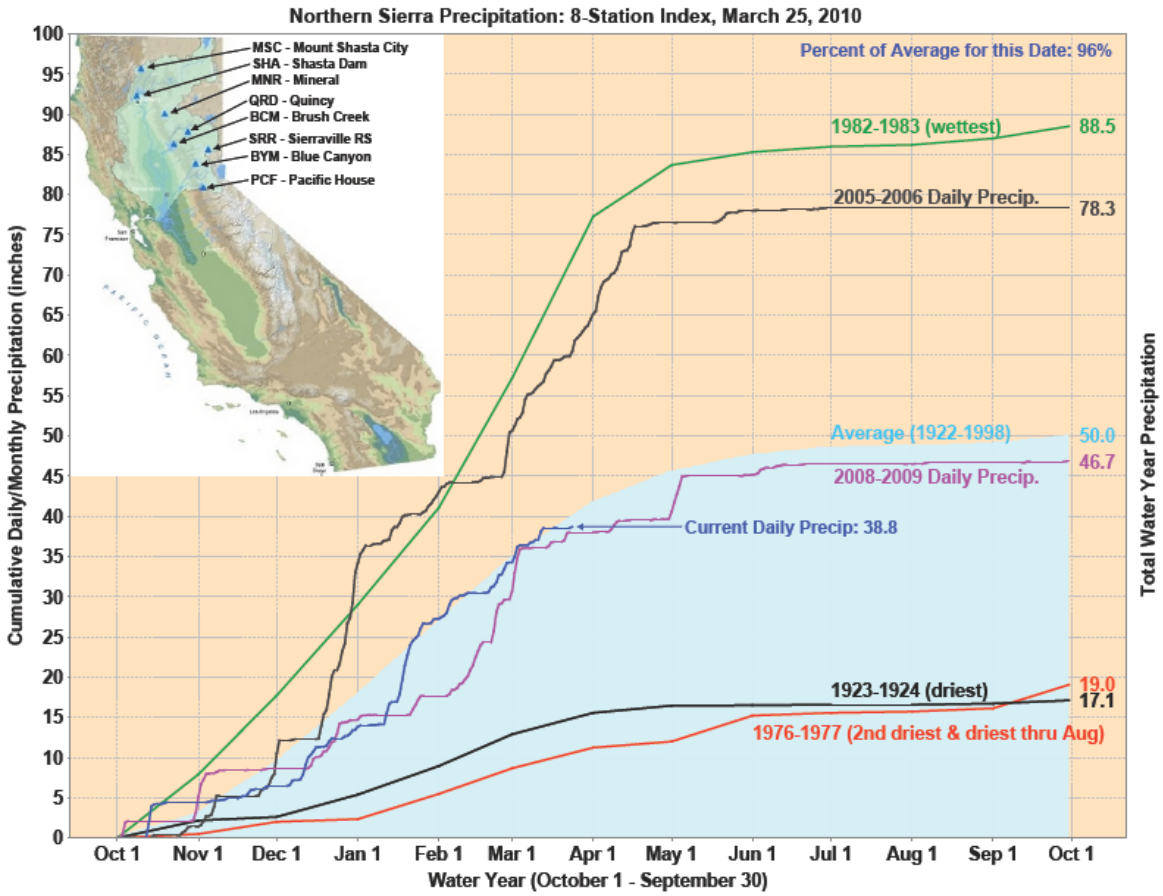

Figure 1. Northern Sierra 8-Station Precipitation Index

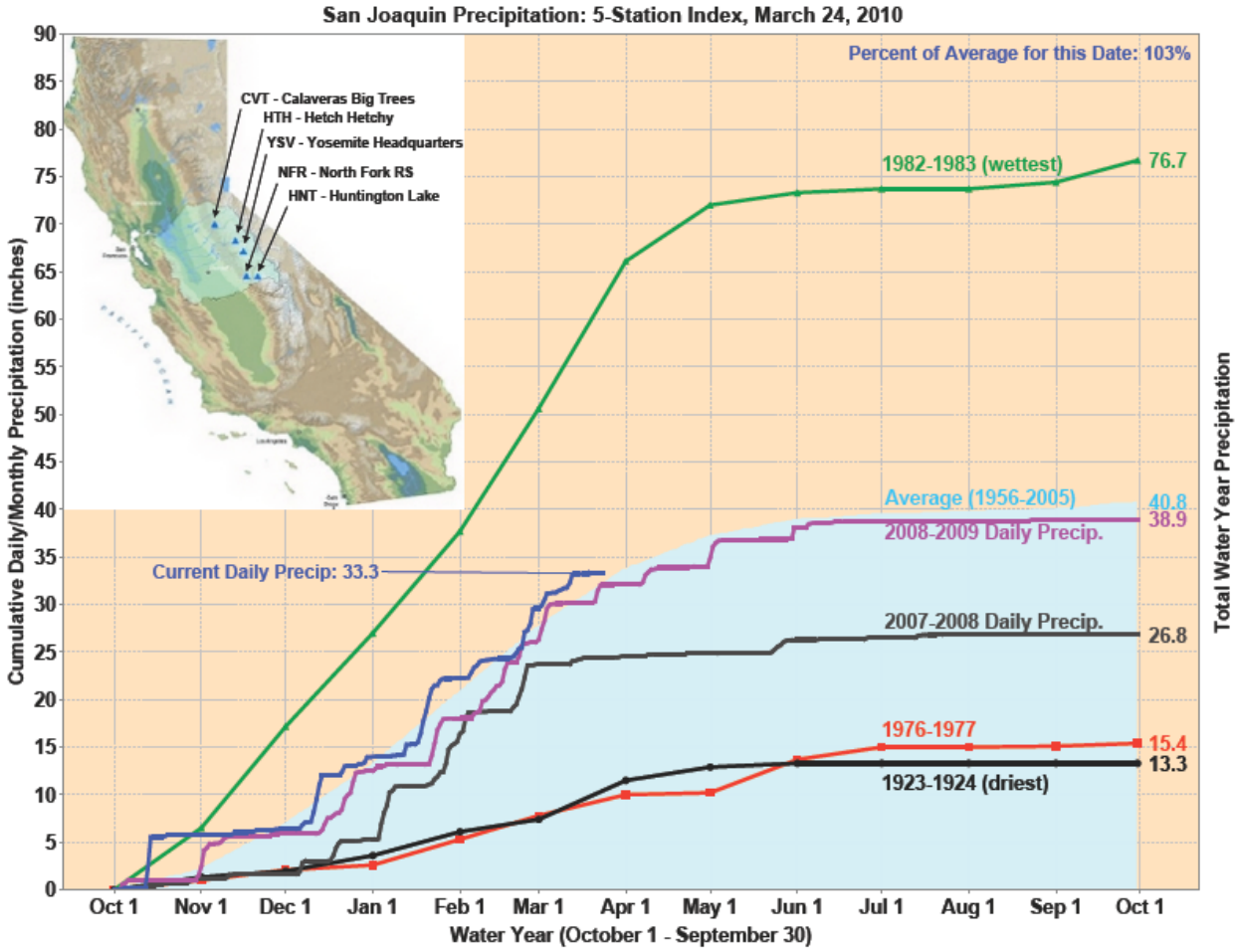

Figure 2. San Joaquin 5-Station Precipitation Index

Snowpack

As of March 24, 2010 the statewide snowpack stands at 29.1 inches, which is 104 percent of average to date and 103 percent of the average April 1 snowpack (typical date of maximum snow accumulation). During Water Year 2009, the snowpack peaked on March 25, 2009 at 25 inches, which was 88 percent of the average April 1 snowpack. Although the 2010 snowpack is currently in decline, it is too early to determine if the snowpack has peaked, as snowpack gains are not unprecedented in April.

Reservoir Storage

Statewide reservoir storage at the end of Water Year 2009 was over 17 MAF or about 80 percent of average and 46 percent of capacity for the date, with individual key reservoirs much lower. Statewide reservoir storage on March 24, 2010 was 16.5 MAF which is about 90 percent of average and 64 percent of capacity. Figure 3 shows the condition of the state's larger reservoirs as of midnight on March 24, 2010.

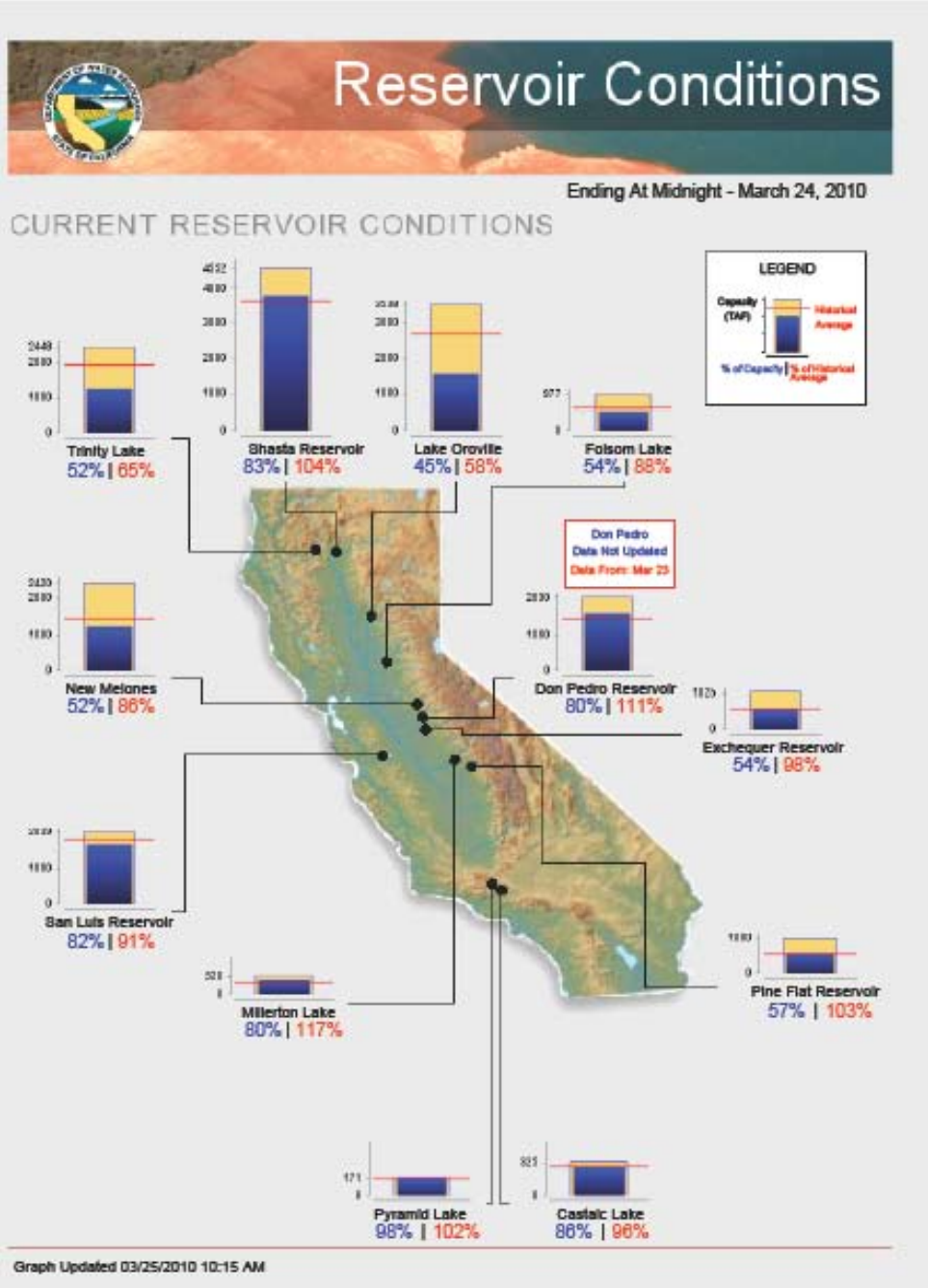

Figure 3. Reservoir storage for select reservoirs shown as percent of capacity (blue) and percent of average (red).

Source:http://cdec4gov.water.ca.gov/cgi-progs/products/rescond.pdf or http:// cdec4gov.water.ca.gov/cgi-progs/reservoirs/RES/

Figure 4 shows detailed reservoir conditions at Lake Oroville, a major water supply for the state which is still well below average conditions.

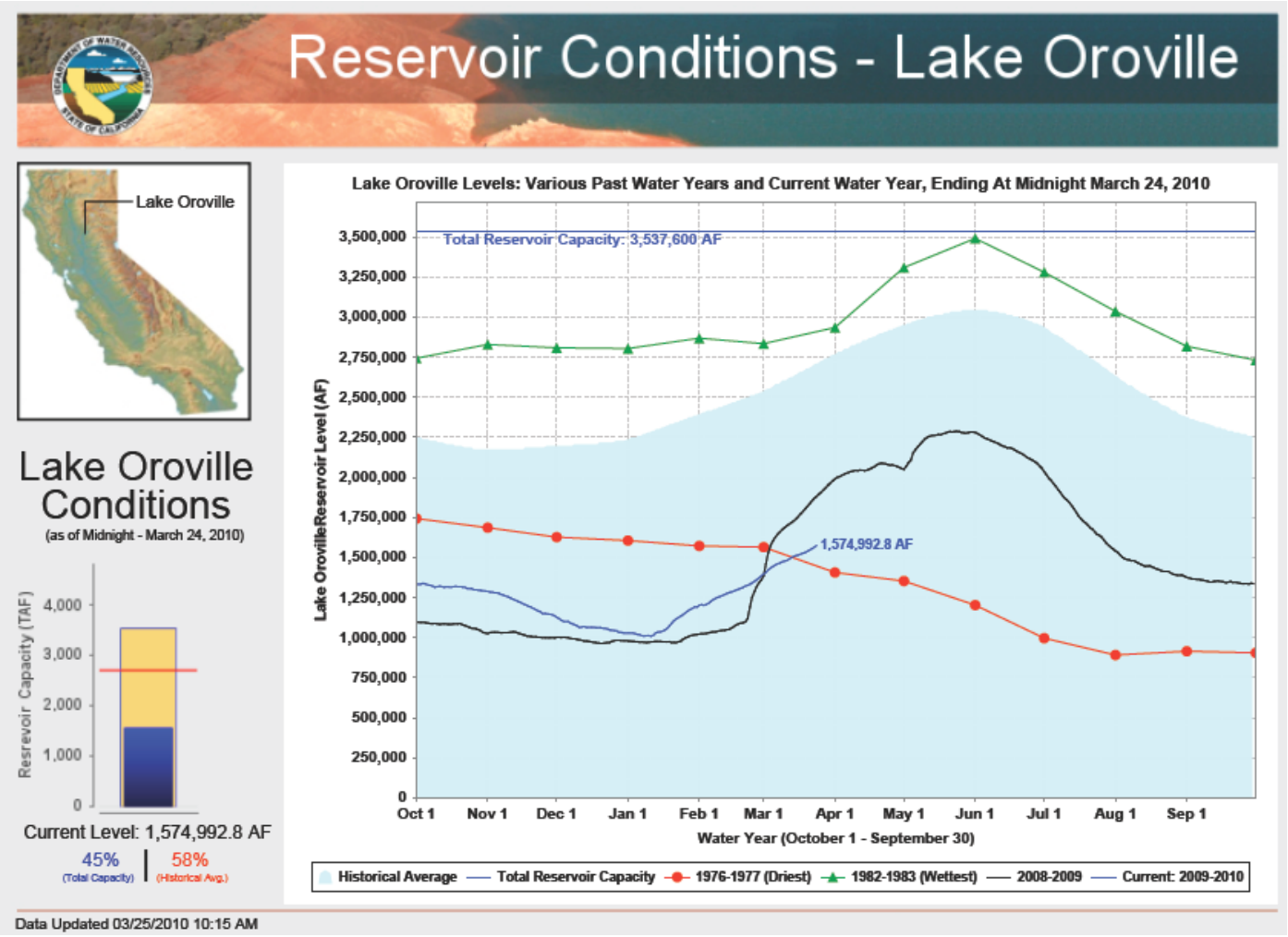

Figure 4. Detailed reservoir conditions for Lake Oroville.

Source:http://cdec4gov.water.ca.gov/cgi-progs/products/rescond.pdf or http:// cdec4gov.water.ca.gov/cgi-progs/reservoirs/RES/

End of Water Year Key Reservoir Storage

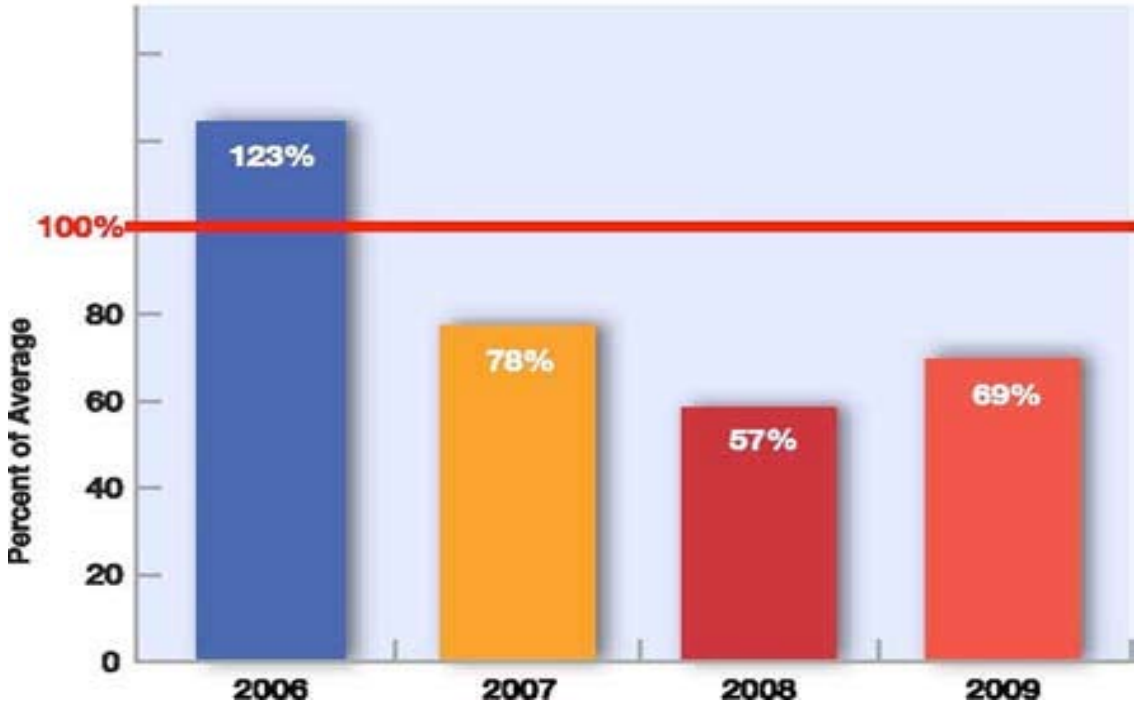

Figure 5. Percent of average end of water year storage for key reservoirs from 2006-2009. ("key reservoirs" comprise Trinity, Shasta, Oroville, Folsom, Don Pedro, New Melones, and San Luis reservoirs)

Figure 5 shows storage for key reservoirs for the end of the last four water years, including the end of this water year on September 30, 2009. The three-year drought, from 2007 to the present, was evident in the well-below normal storage readings. The state entered the 2009-2010 Water Year with its key supply reservoirs at only 69 percent of average. As of March 24, 2010, the summation of storage in the "key reservoirs" was 86 percent of average.

Runoff

Figure 6 shows a comparison of the percent of average annual statewide runoff from Water Years 2006 through 2010 (the 2010 value includes only runoff from October through February and will be updated throughout the Water Year). Water Year 2006 was the most recent wet year in California, with 173 percent of average statewide runoff. Water Year 2007 was the first of three dry years, ending with 53 percent of average statewide runoff. Water Year 2010 stands at 66 percent of average to date (through February). A revised 2010 percent of average annual statewide runoff will be issued in early April for conditions through March and is expected to remain the same. Eight major Sierra rivers are flowing at rates between 50 percent and 85 percent of average from March 1 through March 21.

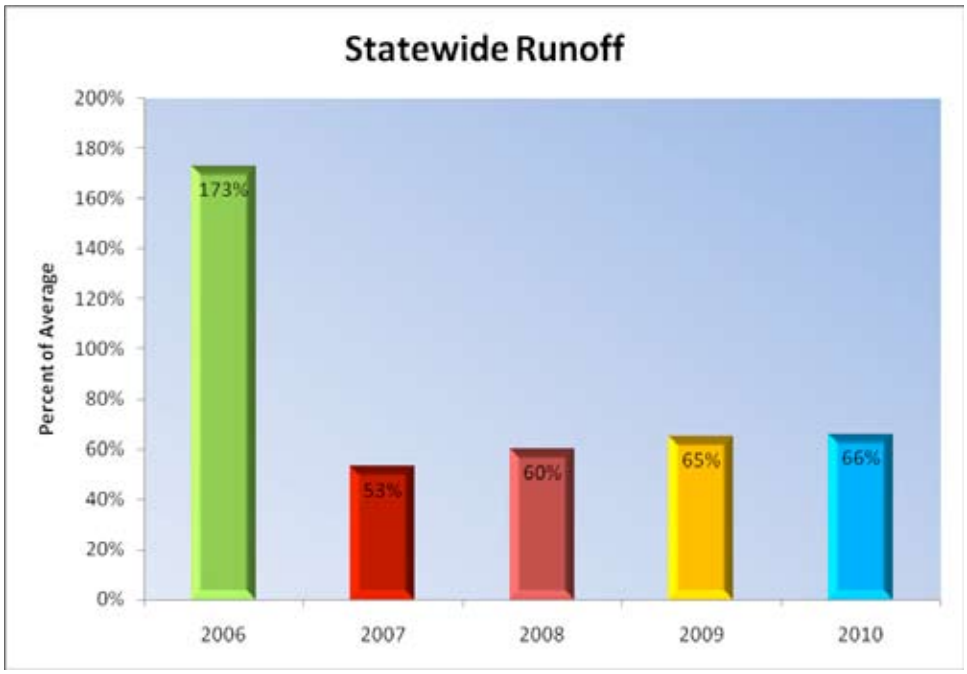

Figure 6. Statewide runoff for water years 2006, 2007, 2008, 2009 and 2010 (through February 28, 2010)

Table 2 shows the Sacramento and San Joaquin River Runoff, WSI and year type for select water years based on observed runoff. This table includes the March 1, 2010, forecasted Sacramento and San Joaquin River Runoff, WSI and Year Type.

	Sacramento River			San Joaquin River		
Water Year	Runoff MAF	Index	Year Type	Runoff MAF	Index	Year Type
2006	32.09	13.2	W	10.44	5.9	W
2007	10.28	6.2	D	2.51	2.0	C
2008	10.28	5.2	C	3.50	2.1	C
2009	12.91	5.8	D	4.97	2.7	BN
2010[1]	14.10	6.3	D	5.30	2.8	BN

[1] March 1, 2010 forecast

Table 2: Sacramento and San Joaquin river runoff, WSI, and year type for select water years based on observed data (W=wet, D=dry, C=critical, BN=below normal)observed data (W=wet, D=dry, C=critical, BN=below normal)

The Sacramento River Unimpaired Runoff was forecasted to be 14.1 million acre-feet (MAF) on March 1, 2010. The San Joaquin River Unimpaired Runoff was forecasted to be 5.3 MAF on March 1, 2010. Both estimates are expected to remain about the same due to near median precipitation and snow during March in the Sacramento River and San Joaquin River basins. The updated runoff forecasts will be published in the April 1, 2010 DWR California Cooperative Snow Surveys Bulletin 120 and will be available on April 12, 2010.
http://cdec.water.ca.gov/cgi-progs/iodir/wsi

Meteorology and Hydrology

As of March 1, 2010, statewide precipitation was 105 percent of average to date. On March 25, the Northern Sierra 8-Station Precipitation Index Water Year total was at 38.8 inches, which is about 96 percent of the seasonal average to date and about 78 percent of an average water year (50 inches). Last year on March 25, the seasonal total to date was 37.8 inches, or about 94 percent of the seasonal average to date. As of March 25, the month's total precipitation for the 8-Stations was 4.5 inches, or about 65 percent of average for the month. Almost all of the State had below average rainfall during March and below average temperatures.

Also on March 24, the San Joaquin 5-Station Precipitation Index had a seasonal total of 33.3 inches, which is about 103 percent of the seasonal total to date. So far during March, the 5-Station Index has received 3.7 inches, which is about 60 percent of the month's average.

Climatology

The latest National Weather Service Climate Prediction Center (CPC) long-range, 1-month weather outlook for April 2010, issued March 18, 2010, suggests no tendency (above or below average) for precipitation. The CPC 90-Day long-range weather outlook for April through June, also issued March 18, has a similar forecast. Both the CPC's 1-month and 3-month weather outlooks suggest an increased chance of above average temperatures for most of California and no tendency for the remaining areas.

State Water Project Allocations

On February 26, 2010 the Department of Water Resources (DWR) increased anticipated 2010 State Water Project (SWP) deliveries to California's water contractors from five to 15 percent of requests. If this amount remains unchanged by the final allocation in late spring this will be the lowest allocation percentage in the project's history.

Although the Central Valley Project (CVP) increased its water delivery allocation on March 16, 2010, poor hydrologic conditions in the Feather River watershed, which feeds into Lake Oroville, is preventing DWR from raising the current 15 percent allocation for 2010 State Water Project deliveries at this time. The CVP has substantially more water in storage than the SWP, largely due to this winter's precipitation patterns. Lake Shasta, north of Redding, the CVP's largest reservoir, is at 104 percent of average for this time of year, and 83 percent of capacity. Lake Oroville in Butte County, the SWP's principal storage reservoir, is only at 58 percent of normal for this time of year, and 45 percent of capacity.

Depending on how hydrology improves, DWR will increase the delivery allocation accordingly. The initial 2010 allocation, announced in December 2009, was 5 percent of contractor requests. DWR raised the initial allocation to 15 percent in February.

A notice to SWP contractors appears on DWR's State Waster Project Analysis Office Web site at: http://www.swpao.water.ca.gov/notices/.

Central Valley Project Allocations

Secretary of the Interior Ken Salazar announced on March 16, 2010 that the Bureau of Reclamation's 2010 Central Valley Project Water Supply allocations have increased throughout the valley as a result of additional precipitation, improved snowpack, and improved storage at Shasta Reservoir. The allocations are based on a forecast of hydrologic conditions as they existed as of March 1, 2010, including DWR's March Water Year 2010 Runoff Forecast, and supplemented with additional information collected through the month.

For CVP agricultural water service contractors north of the Delta, the water supply forecast increases from 5 percent to 50 percent, and the water supply forecast for Municipal and Industrial (M&I) water service contractors north of the Delta increases from 55 percent to 75 percent. For agricultural water service contractors south of the Delta, the water supply forecast increases from 5 percent to 25 percent, while the water supply forecast for M&I users south of the Delta increases from 55 percent to 75 percent of historic use. Further, the Class 2 water supply forecast for Friant Division contractors increases from 0 to 10 percent; the Class 1 water supply forecast for Friant Division contractors remains at 100 percent.

Since the initial water supply announcement based on the February 1, 2010, runoff forecast, California has experienced a continued improvement in overall CVP water supply conditions as wet weather patterns progressed throughout February. The increases in CVP allocations result from additional precipitation, improved snowpack, and improved storage at Shasta Reservoir and the federal share of San Luis Reservoir. Improved inflow to Millerton Lake has led to the increase in Friant Division supplies.

For more detailed information about the initial 2010 Central Valley Project water supply forecast, please go to http://www.usbr.gov/mp/pa/water

Local Impacts and Responses to the Drought

North Coast, Bay Area, and Sacramento River Hydrologic Regions — Drought conditions in the Klamath Basin have severely impacted users in the Klamath Project water users in both Oregon and California. On March 17, 2010 Oregon Governor Ted Kulongoski issued an executive order determining a state of drought emergency in Klamath County as well as all bordering counties which includes Jackson, Douglas, Lane, Deschutes and Lake counties. This declaration provides the state flexible water management strategies to assist irrigators, municipalities and other water users, not generally available under Oregon law. On March 18, 2010 the Secretary of the Interior Ken Salazar announced expected Klamath Project allocations of 30 to 40 percent of average annual releases – approximately 150,000

acre-feet – to be made available to Upper Klamath Lake irrigators. The U.S. Department of Agriculture's Natural Resources Conservation Service also announced that drought-impacted farmers in the Klamath Project will be eligible to apply for $2 million in special drought-related funding under its Environmental Quality Incentives Program, $1 million for Oregon farmers and $1 million for California farmers.

In response to this year's dry conditions in the Klamath Basin, Reclamation consulted with the US Fish and Wildlife Service (FWS) and National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) to develop a 2010 Project operations approach that is fully protective of protected species in the Basin while allowing for some meaningful irrigation releases. Reclamation and NMFS executed a new biological opinion that protects downstream fisheries, and based on its consultation with FWS and current modeling forecasts, Reclamation estimates that irrigation deliveries could begin as soon as May 15, depending upon additional precipitation in the Klamath Basin and Upper Klamath Lake levels. More information on the Klamath Project, including drought response actions can be found at http://www.usbr.gov/mp/kbao/.

Storage in Lake Mendocino continues to be at its historical average or about 81,000 acre-feet as of March 28. Storage in Marin Municipal Water District reservoirs as of March 21 is above average at 99 percent of capacity compared to 83 percent of capacity at this time in 2009. Storage in Santa Clara Valley Water District reservoirs increased in March to about 72 percent of capacity as of March 26. Storage in Yolo County Flood Control and Water Conservation District's Indian Valley Reservoir, reported low in January, increased in February and March but is still only about 25 percent of capacity as of March 28, 2010.

North Lahontan Hydrologic Region — Lake Tahoe's water level has remained above its natural rim (elevation 6223 feet) since January 24 and is at 6223.25 as of March 25. Storms in early March improved snowpack conditions for reservoirs in the Sierra.

South Coast, South Lahontan, and Colorado River Hydrologic Regions — In southern California, the storms in February caused street flooding in urban areas and mudflows from burned hillsides resulting in mandatory evacuations and damages to properties in some communities. In spite of flooding, after three consecutive years of severe drought conditions, the recent storms were not enough to bring the State's water reserves back to full storage capacities. Undoubtedly, the storms have helped reserve levels but storage at the biggest reservoir in the region, Diamond Valley Lake, operated by the Metropolitan Water District remain unchanged at 48 percent of capacity as of March 23, 2010. The combined storage of reservoirs operated by member agencies of the San Diego County Water Authority stood at 54.3 percent as of March 15, 2010, up by 4 percent from previous month. Many of these reservoirs have been at record low levels and need a steady flow of rain and runoff and other supplies to bring them back to capacity. Regulatory restrictions continue to limit the amount of water that can be pumped from the Delta, which is the major source of water for Southern California.

The common message from local water agencies to their customers is that recent rains have not ended the state's drought. Many agencies have stepped up the call for increased levels of water-use efficiency and are educating consumers with the message that southern California's water supply situation is a complex issue that will take much more than rain to fix.

Water Conservation Actions by Local Water Agencies

As of March 30, 2010, there are 67 local water agencies in California that have mandated water conservation and 56 water agencies urging voluntary conservation measures. This is unchanged from the previous month. A current update of the number of agencies mandating conservation and urging voluntary conservation measures can be found at the Association of California Water Agencies (ACWA) website, http://www.acwa.com/issues/cadrought/

Summary

While precipitation and snowpack statewide conditions are near average and storage in most reservoirs have improved from the previous water year, statewide runoff continues to be significantly below average in Water Year 2009-2010 at 66 percent, similar to the Water Year 2008-2009 at 65 percent. Storage at Lake Oroville, a major water supply reservoir for the State, remains low at 58 percent of average. With average statewide precipitation forecast for the next few months, and below average runoff forecast for the Sacramento River and San Joaquin River basins, it is still uncertain whether conditions have improved sufficiently to remove drought conditions. Although the Central Valley Project increased its water delivery allocation on March 16, 2010, poor hydrologic conditions in the Feather River watershed, which feeds into Lake Oroville, is preventing DWR from raising the current 15 percent allocation for 2010 State Water Project deliveries at this time.


Photography: DWR

The March 30, 2010 Drought Update was prepared by:
Douglas Osugi, Supervising Water Resources Engineer

Credits:

Statewide Hydrologic and Water Supply Data
David Rizzardo, Senior Water Resources Engineer
David Ho, Hydrologist
Boone Lek, Senior Water Resources Engineer
Andy Reising, Water Resources Engineer
John King, Water Resources Engineer
Michael Anderson, State Climatologist
Matt Winston, Senior Meteorologist
Derick Louie, Water Resources Engineer
Tracy Pettit-Polhemus, Supervising Water Resources Engineer

Local Drought Impacts and Responses
Jim Rich, Economist
Pierre Stephens, Supervising Water Resources Engineer
Gary Lippner, Senior Water Resources Engineer
Shicha Chander, Water Resources Engineer
David Barth, Student E & A
Brian Moniz, Senior Water Resources Engineer
Abiodun Aderonmu, Water Resources Engineer
Manucher Alemi, Chief, Water Use and Efficiency Branch
Thang Nguyen, Supervising Water Resources Engineer
Simon Eching, Senior Land and Water Use Scientist

Production Services
Xiaojun Li, Graphic Services
Mark McCourt, Graphic Services
M. Elizabeth Scott, Public Affairs Information Officer